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10/516,582	06/17/2005	Sunil Madhukar Bhangale	3172.ARTH.PT	9938

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EXAMINER	
BAREFORD, KATHERINE A	
ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/516,582	BHANGALE ET AL.	
	Examiner	Art Unit	
	Katherine A. Bareford	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,6-10,12-27 and 29-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,6-10,12-27 and 29-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The amendment filed May 2, 2008 has been received and entered. With the entry of the amendment, claims 5, 11 and 28 have been canceled, and claims 1-4, 6-10, 12-27 and 29-31 (including new claims 30-31) are pending for examination.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 9, line 1, the claim depends from canceled claim 5, and therefore is confusing as to what is required. For the purpose of examination, the Examiner has treated the claim as depending from claim 1, but applicant should clarify what is intended.

Claim 9, line 1, "the palladium particles" lacks antecedent basis.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1, 2, 6-10, 12, 15-17, 19, 22, 27, 29 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doany et al (US 7033648) in view of Gulla et al (US 4725314).

Claims 1, 29: Doany teaches a method of seeding (activating) and metallizing an aromatic polymer film in the form of polyimide. Column 2, lines 10-25 and column 6, line 45 through column 7, line 25. A first surface of the polyimide is pretreated with a basic (alkali) solution of metal hydroxide, such as sodium or potassium hydroxide. Column 5, line 65 through column 6, line 5 and column 6, line 65 through column 7, line 5. Following the pretreatment step, an aqueous seeding solution of catalyst such as palladium is applied to the first surface of the film. Column 7, lines 1-10. Then the film

is immersed in an electroless plating bath comprising ions of a desired metal (such as copper) so as to deposit a layer of metal onto the first surface of the film. Column 7, lines 10-20. A resulting coated product is formed by the method. Column 7, lines 10-25.

Claim 2: the basic solution can be a solution of potassium hydroxide. Column 6, lines 1-2.

Claim 10: the desired metal can be copper. Column 7, lines 10-20.

Claim 12: the basic solution is applied by immersing the film in a bath of the basic solution. Column 6, lines 65-68.

Claim 17: the film is washed with water after catalyzing for 60 seconds. Column 7, lines 5-10.

Claim 19: the film is heated after depositing the electroless plating layer of metal. Column 7, lines 15-20.

Claim 22: prior to applying the basis solution, photoresist material is applied to the film and developed so as to assist patterning. Column 6, lines 50-65. This pattern can be used to form circuitry. Column 1, lines 20-25.

Claim 27: the polymer film is a polyimide. Column 2, lines 5-15.

Doany teaches all the features of these claims except (1) the use of polymer stabilized catalyst particles and their features (claims 1, 6-9, 29, 31), (2) the immersion in the seeding solution and its time (claims 15, 16), (3) washing with deionized water (claim 17).

However, Gulla teaches the known replacement of conventional palladium containing catalyst deposition for electroless plating activation with polymer stabilized palladium catalyst particles (that is, the catalyst is fixed to the suspending polymer agent) in aqueous solution. Column 3, lines 5-20, column 3, line 55 through column 4, line 15, column 4, lines 20-40, column 15, lines 25-30. The particles can be stabilized by a water soluble polymer, such as polyvinyl pyrrolidione (PVP) or polyvinyl alcohol. Column 5, lines 45-60 and column 15, lines 25-30. The palladium (catalyst metal) particles can have diameters of 50-500 Angstroms (5-50 nm). Column 9, lines 35-50. The palladium particles can be applied as a catalyst by immersing the substrate into a solution containing the particles. Column 11, lines 25-30. The contact can be for a variable time controlled to provide desirable plating to occur in one to three minutes. Column 11, lines 25-30. Then the surface is water rinsed. Column 11, lines 35-40 and column 12, lines 35-45. The substrate to be treated can be a nonconductor such as an ABS polymer (column 10, lines 5-15) or can be an unclad circuit board (column 17, lines 25-30).

The Examiner takes Official Note that it is well known in the art of electroless plating to perform water rinsing/washing steps with deionized water. As applicant has not traversed this position from the February 4, 2008 Office Action, it is understood to be agreed to.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany to use the polymer stabilized palladium catalyst

particles with the features taught by Gulla as the seeding catalyst with an expectation of desirable plating results, because Doany teaches to use, for example, appropriate palladium salt solutions (column 6, lines 10-15) for seeding for electroless plating and Gulla teaches that a desirable palladium catalysts for seeding for electroless plating on surfaces that can be polymer surfaces is to use polymer stabilized palladium catalyst particles, stabilized with PVP or polyvinyl alcohol, for example and having a palladium particle size of 5-50 nm, and to apply the particles by immersion in a bath of the seeding solution for a variable period of time, and then to rinse the surface with water. As to the precise size of the particles, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), and Gulla provides for a range of 5-50 nm. As to the precise time of contact with the seeding solution, Gulla provides for a variable contact time, indicating that it is a result effective variable, and "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). As to the use of deionized water, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water rinsing/washing steps in electroless plating processes.

7. Claims 3, 4, 14, 18 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doany in view of Gulla as applied to claims 1, 2, 6-10, 12, 15-17, 19, 22, 27, 29 and 31 above, and further in view of Fraenkel et al (US 4803097).

Doany in view of Gulla teach all the features of these claims except (1) the acid solution treatment and its material (claims 3, 4), (2) the time of contact with the basic solution and washing off after contact (claim 14), (3) washing the applied metal layer after coating with deionized water and drying (claim 18).

Fraenkel teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 5, lines 35-60, column 1, lines 5-15 and column 13, lines 1-25. A first surface of the polymer is pretreated with a basic solution (conditioning solvent) of a material such as potassium hydroxide. Column 6, line 65 through column 7, line 25. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 13, lines 1-20. Then the substrate is immersed in an electroless plating bath. Column 12, lines 1-15 and column 13, lines 15-25. After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 8, lines 5-10. The acid solution can be a solution of hydrochloric acid. Column 8, lines 5-10. The time of contact with the basic solution can be 10 minutes. Column 12, lines 55-65. After treatment with the basic solution the samples are rinsed with water. Column 12, lines 55-65. After the electroless plating is applied, the coated article is rinsed with water. Column 13, lines 15-25. Heating can also occur after plating. Column 13, lines 45-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany in view of Gulla to provide a hydrochloric acid solution treatment between the basic solution treatment and the catalyst treatment as suggested by Fraenkel in order to provide desirable conditioning of the surface, because Doany in view of Gulla teaches a treatment process for electroless plating with a basic solution treatment followed by a catalyst treatment, and Fraenkel teaches that when providing a basic solution treatment followed by a catalyst treatment, it is desirable to provide a hydrochloric acid solution treatment between the steps. It would further have been obvious to modify Doany in view of Gulla to provide a solution contact time of ten minutes, for example, and to wash after application as suggested by Fraenkel in order to provide desirable pretreatment, because Doany in view of Gulla teaches a basic solution pretreatment before electroless plating, and Fraenkel teaches that when providing a basic solution pretreatment before electroless plating, it is well known to have a solution contact time of ten minutes, for example, and to wash after application. It further would have been obvious to modify Doany in view of Gulla to provide washing and drying after plating as suggested by Fraenkel in order to provide desirable plating, because Doany in view of Gulla teaches to perform electroless plating, and Fraenkel teaches that it is well known to perform water rinsing (washing) after plating and heating which would provide drying. Furthermore, it would have been obvious for the water to be deionized, because as discussed in the rejection above, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art

for desirable plating results, because it is well known to be conventional to use deionized water in water rinsing/washing steps in electroless plating processes.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Doany in view of Gulla as applied to claims 1, 2, 6-10, 12, 15-17, 19, 22, 27, 29 and 31 above, and further in view of Lake et al (US 4915983).

Doany in view of Gulla teach all the features of this claim except spraying the layer of basic solution onto the surface of the polymer.

Lake teaches a plating method for polyimide containing circuit boards, where a treatment with potassium hydroxide solution is provided. Column 9, lines 30-65. Lake teaches that such an application of potassium hydroxide solution can be performed by either spray or immersion. Column 9, lines 45-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany in view of Gulla to apply the basic solution by spraying as suggested by Lake in order to provide desirable conditioning of the surface, because Doany in view of Gulla teaches a treatment process for electroless plating with a basic solution treatment that is applied by immersion, and Lake teaches that when applying a basic solution treatment of potassium hydroxide, for example, either spray or immersion techniques can desirably be used.

9. Claims 3, 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doany in view of Gulla as applied to claims 1, 2, 6-10, 12, 15-17, 19, 22, 27, 29 and 31 above, and further in view of Walsh (US 5478462).

Doany in view of Gulla teach all the features of these claims except (1) the acid treatment (claim 3), (2) vias formed prior to applying the basic solution (claim 20) and (3) cleaning and drying the film prior to applying the basic solution (claim 23). Doany teaches the desire to make circuits, etc. Column 1, lines 20-30.

Walsh teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 1, lines 20-30 and column 9, lines 50-65. A first surface of the polymer is pretreated with a basic solution of a material such as potassium hydroxide. Column 5, lines 15-30 and column 9, lines 10-50. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 9, lines 50-65. Then the substrate is immersed in an electroless plating bath. Column 13, lines 45-55. After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 13, lines 25-50. Prior to treatment the substrate can have vias formed. Column 7, lines 1-10 and column 14, lines 30-40. Prior to the step of applying the basic solution, the substrate can be cleaned. Column 9, lines 5-10.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany in view of Gulla to provide an acid solution treatment between the basic solution treatment and the catalyst treatment as suggested by Walsh in order to provide desirable pretreatment of the surface, because Doany in

view of Gulla teaches a treatment process for electroless plating with a basic solution treatment followed by a catalyst treatment, and Walsh teaches that when providing a basic solution treatment followed by a catalyst treatment, it is desirable to provide an acid solution treatment between the steps. It further would have been obvious to modify Doany in view of Gulla to provide vias formed in the substrate before treatment as suggested by Walsh in order to provide desirable circuit systems, because Doany in view of Gulla provides a treatment that can be for circuit systems, and Walsh teaches that when treating products used for such systems, it is well known to provide vias in the substrate before pretreatment and coating. It further would have been obvious to modify Doany in view of Gulla to provide that the substrate is cleaned and dried before coating as suggested by Walsh to provide a desirable surface for treatment, because Doany in view of Gulla provides pretreating a surface with basic solution, and Walsh teaches that before such treatment it is well known to clean the surface, and it would further have been obvious for the surface to be dried because if the surface is not cleaned a dried surface is started with, and therefore a dried surface is the standard starting point.

10. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Doany in view of Gulla and Walsh as applied to claims 3, 20 and 23 above, and further in view of Nuzzi et al (US 4425380).

Doany in view of Gulla and Walsh teach all the features of these claims except forming the vias by laser drilling.

Nuzzi teaches that when forming vias in substrates for circuit boards, it is well known to use laser drilling to form the holes. Column 1, lines 10-55.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany in view of Gulla and Walsh to form the vias by laser drilling as suggested by Nuzzi in order to provide desirable vias, because Doany in view of Gulla and Walsh teaches a treatment process for electroless plating for circuit boards with a substrate with preformed vias, and Nuzzi teaches that a well known way to form such vias is by laser drilling.

11. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Doany in view of Gulla and Walsh as applied to claims 3, 20 and 23 above, and further in view of Morgan (US 5543217).

Doany in view of Gulla and Walsh teach all the features of this claim except forming the cleaning by ultrasonication in acetone and deionized water.

Morgan teaches that it is well known to clean polyimide substrates using acetone in an ultrasonic bath. Column 16, lines 50-55.

The Examiner takes Official Notice that adding water to acetone and other cleaning baths is a conventional way to control the concentration. As applicant has not

traversed this position from the February 4, 2008 Office Action, it is understood to be agreed to.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany in view of Gulla and Walsh to clean the substrate with acetone in an ultrasonic bath as suggested by Morgan in order to provide a clean polyimide substrate, because Doany in view of Gulla and Walsh teaches a treatment process for electroless plating with a base of polyimide where precleaning can occur, and Morgan teaches that a well known way to clean polyimide is using acetone with ultrasonication. Furthermore, the use of water in the bath would be a conventional way to control the concentration of the bath for desirable control, and as to the use of deionized water, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water use steps in electroless plating processes as previously discussed.

12. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doany in view of Gulla, Walsh and Morgan as applied to claim 24 above, and further in view of Fraenkel et al (US 4803097).

Doany in view of Gulla, Walsh and Morgan teach all the features of these claims except the ozone treatment.

Fraenkel teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 5, lines 35-60, column 1, lines 5-15 and column 13, lines 1-25. A first surface of the polymer is pretreated with a basic solution (conditioning solvent) of a material such as potassium hydroxide. Column 6, line 65 through column 7, line 25. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 13, lines 1-20. Then the substrate is immersed in an electroless plating bath. Column 12, lines 1-15 and column 13, lines 15-25. After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 8, lines 5-10. The acid solution can be a solution of hydrochloric acid. Column 8, lines 5-10. The time of contact with the basic solution can be 10 minutes. Column 12, lines 55-65. After treatment with the basic solution the samples are rinsed with water. Column 12, lines 55-65. After the electroless plating is applied, the coated article is rinsed with water. Column 13, lines 15-25. Heating can also occur after plating. Column 13, lines 45-50. Fraenkel further teaches that an ozone pretreatment is provided before the basic solution step, which provides etching (which would provide further "cleaning" as surfaces would be removed). Column 4, lines 50-65. The ozone temperature treatment can be elevated. Column 4, lines 35-45. The ozone treatment can be at between 50-110 degrees C for a time of 1-5 seconds to 1-2 hours. Column 4, line 35 through column 5, line 2.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Doany in view of Gulla, Walsh and Morgan to provide

the ozone pretreatment as suggested by Fraenkel in order to provide desirable conditions for the pretreatment, because Doany in view of Gulla, Walsh and Morgan teaches a pretreatment process for electroless plating, and Fraenkel teaches that in such a pretreatment process it is desirable to perform ozone treatment before the application of a basic solution. Furthermore, as to the conditions of treatment, Fraenkel teaches temperatures and times overlapping that claimed, and in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

13. Claims 1-4, 6-10, 14-19, 27 and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fraenkel et al (US 4803097) in view of Gulla et al (US 4725314).

Claims 1, 29: Fraenkel teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 5, lines 35-60, column 1, lines 5-15 and column 13, lines 1-25. A first surface of the polymer is pretreated with a basic solution (conditioning solvent) of a material such as potassium hydroxide. Column 6, line 65 through column 7, line 25. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 13, lines 1-20. Then the substrate is immersed in an electroless plating bath to deposit a layer of metal onto the first surface. Column 12, lines 1-15 and column 13, lines 15-25. A coated product is formed by this method. Column 13, lines 1-50.

Claim 2: the basic solution can be potassium hydroxide. Column 7, lines 5-10.

Claims 3-4, 30: After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 8, lines 5-10. The acid solution can be a solution of hydrochloric acid. Column 8, lines 5-10.

Claim 10: the metal to be plated can be copper or nickel. Column 13, lines 15-20.

Claim 14: The time of contact with the basic solution can be 10 minutes. Column 12, lines 55-65. After treatment with the basic solution the samples are rinsed with water. Column 12, lines 55-65.

Claim 15: the seeding solution is applied by immersion. Column 13, lines 1-15.

Claim 17: after application of the seeding solution, the film is washed with water. column 13, lines 5-20.

Claim 18: After the electroless plating is applied, the coated article is rinsed with water. Column 13, lines 15-25.

Claim 19: Heating can also occur after plating. Column 13, lines 45-50.

Claim 27: the polymer film can be polyimide. column 5, lines 35-60.

Fraenkel teaches all the features of these claims except (1) the use of polymer stabilized catalyst particles and their features (claims 1, 6-9, 29, 31), (2) the immersion in the specific seeding solution and its time (claims 15, 16), (3) washing with deionized water (claim 17, 18).

However, Gulla teaches the known replacement of conventional palladium containing catalyst deposition for electroless plating activation with polymer stabilized palladium catalyst particles (that is, the catalyst is fixed to the suspending polymer

agent) in aqueous solution. Column 3, lines 5-20, column 3, line 55 through column 4, line 15, column 4, lines 20-40, column 15, lines 25-30. The particles can be stabilized by a water soluble polymer, such as polyvinyl pyrrolidione (PVP) or polyvinyl alcohol. Column 5, lines 45-60 and column 15, lines 25-30. The palladium (catalyst metal) particles can have diameters of 50-500 Angstroms (5-50 nm). Column 9, lines 35-50. The palladium particles can be applied as a catalyst by immersing the substrate into a solution containing the particles. Column 11, lines 25-30. The contact can be for a variable time controlled to provide desirable plating to occur in one to three minutes. Column 11, lines 25-30. Then the surface is water rinsed. Column 11, lines 35-40 and column 12, lines 35-45. The substrate to be treated can be a nonconductor such as an ABS polymer (column 10, lines 5-15) or can be an unclad circuit board (column 17, lines 25-30).

The Examiner takes Official Note that it is well known in the art of electroless plating to perform water rinsing/washing steps with deionized water. As applicant has not traversed this position from the February 4, 2008 Office Action, it is understood to be agreed to.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Fraenkel to use the polymer stabilized palladium catalyst particles with the features taught by Gulla as the seeding catalyst with an expectation of desirable plating results, because Fraenkel teaches to use, for example, appropriate conventional electroless plating procedures (column 12, lines 1-15) and

palladium containing solutions (column 13, lines 1-10) for seeding for electroless plating and Gulla teaches a desirable palladium catalyst system for seeding for electroless plating is to use polymer stabilized palladium catalyst particles, stabilized with PVP or polyvinyl alcohol, for example and having a palladium particle size of 5-50 nm, and to apply the particles by immersion in a bath of the seeding solution for a variable period of time, and then to rinse the surface with water. As to the precise size of the particles, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), and Gulla provides for a range of 5-50 nm. As to the precise time of contact with the seeding solution, Gulla provides for a variable contact time, indicating that it is a result effective variable, and "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). As to the use of deionized water, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water rinsing/washing steps in electroless plating processes.

14. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fraenkel in view of Gulla as applied to claims 1-4, 6-10, 14-19, 27 and 29-31 above, and further in view of Lake et al (US 4915983).

Fraenkel in view of Gulla teach all the features of these claims except immersing or spraying the layer of basic solution onto the surface of the polymer.

Lake teaches a plating method for polyimide containing circuit boards, where a treatment with potassium hydroxide solution is provided. Column 9, lines 30-65. Lake teaches that such an application of potassium hydroxide solution can be performed by either spray or immersion. Column 9, lines 45-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Fraenkel in view of Gulla to apply the basic solution by immersion or spraying as suggested by Lake in order to provide desirable conditioning of the surface, because Fraenkel in view of Gulla teaches a treatment process for electroless plating with a basic solution treatment that is applied to contact the substrate, and Lake teaches that when applying a basic solution treatment of potassium hydroxide, for example, either spray or immersion techniques can desirably be used.

15. Claims 20 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fraenkel in view of Gulla as applied to claims 1-4, 6-10, 14-19, 27 and 29-31 above, and further in view of Walsh (US 5478462).

Fraenkel in view of Gulla teach all the features of these claims except (1) vias formed prior to applying the basic solution (claim 20) and (2) cleaning and drying the film prior to applying the basic solution (claim 23). Fraenkel teaches the desire to make circuits, etc. Column 3, lines 10-15.

Walsh teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 1, lines 20-30 and column 9, lines 50-65. A first surface of the polymer is pretreated with a basic solutionof a material such as potassium hydroxide. Column 5, lines 15-30 and column 9, lines 10-50. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 9, lines 50-65. Then the substrate is immersed in an electroless plating bath. Column 13, lines 20-55. After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 13, lines 25-50. Prior to treatment the substrate can have vias formed. Column 7, lines 1-10 and column 14, lines 30-40. Prior to the step of applying the basic solution, the substrate can be cleaned. Column 9, lines 5-10.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Fraenkel in view of Gulla to provide vias formed in the substrate before treatment as suggested by Walsh in order to provide desirable circuit systems, because Fraenkel in view of Gulla provides a treatment that can be for circuit systems, and Walsh teaches that when treating products used for such systems, it is well known to provide vias in the substrate before pretreatment and coating. It further would have been obvious to modify Fraenkel in view of Gulla to provide that the substrate is cleaned and dried before coating as suggested by Walsh to provide a desirable surface for treatment, because Fraenkel in view of Gulla provides pretreating a surface with basic solution, and Walsh teaches that before such treatment it is well known to clean the surface, and it would further have been obvious for the surface to be

dried because if the surface is not cleaned a dried surface is started with, and therefore a dried surface is the standard starting point.

16. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fraenkel in view of Gulla and Walsh as applied to claims 20 and 23 above, and further in view of Nuzzi et al (US 4425380).

Fraenkel in view of Gulla and Walsh teach all the features of this claim except forming the vias by laser drilling.

Nuzzi teaches that when forming vias in substrates for circuit boards, it is well known to use laser drilling to form the holes. Column 1, lines 10-55.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Fraenkel in view of Gulla and Walsh to form the vias by laser drilling as suggested by Nuzzi in order to provide desirable vias, because Fraenkel in view of Gulla and Walsh teaches a treatment process for electroless plating for circuit boards with a substrate with preformed vias, and Nuzzi teaches that a well known way to form such vias is by laser drilling.

17. Claims 24-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fraenkel in view of Gulla and Walsh as applied to claims 20 and 23 above, and further in view of Morgan (US 5543217).

Doany in view of Gulla and Walsh teach all the features of these claims except forming the cleaning by ultrasonication in acetone and deionized water. Fraenkel further teaches that an ozone pretreatment is provided before the basic solution step, which provides etching (which would provide further "cleaning" as surfaces would be removed). Column 4, lines 50-65. The ozone temperature treatment can be elevated. Column 4, lines 35-45. The ozone treatment can be at between 50-110 degrees C for a time of 1-5 seconds to 1-2 hours. Column 4, line 35 through column 5, line 2.

Morgan teaches that it is well known to clean polyimide substrates using acetone in an ultrasonic bath. Column 16, lines 50-55.

The Examiner takes Official Notice that adding water to acetone and other cleaning baths is a conventional way to control the concentration. As applicant has not traversed this position from the February 4, 2008 Office Action, it is understood to be agreed to.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Fraenkel in view of Gulla and Walsh to clean the substrate with acetone in an ultrasonic bath as suggested by Morgan in order to provide a clean polyimide substrate, because Fraenkel in view of Gulla and Walsh teaches a treatment process for electroless plating with a base of polyimide where precleaning can occur, and Morgan teaches that a well known way to clean polyimide is using acetone with ultrasonication. Furthermore, the use of water in the bath would be a conventional way to control the concentration of the bath for desirable control, and as to

the use of deionized water, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water use steps in electroless plating processes as previously discussed.

18. Claims 1-3, 6-10, 12, 14-17, 19-20, 23, 27, 29 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walsh (US 5478462) in view of Gulla et al (US 4725314).

Claims 1, 29: Walsh teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 1, lines 20-30 and column 9, lines 50-65. A first surface of the polymer is pretreated with a basic solution of a material such as potassium hydroxide. Column 5, lines 15-30 and column 9, lines 10-50. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 9, lines 50-65. Then the substrate is immersed in an electroless plating bath to deposit a layer of metal. Column 13, lines 20-55. A coated product is formed by the method. Column 13, lines 45-55.

Claim 2: the basic solution can be potassium hydroxide. Column 9, lines18-25.

Claims 3: After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 13, lines 25-50.

Claim 10: the metal to be plated can be nickel. Column 13, lines 45-55.

Claim 12: the basic solution is applied by immersing the film in a bath of the solution. Column 13, lines 20-40.

Claim 14: The time of contact with the basic solution can be 1 minute. Column 13, lines 25-35. After treatment with the basic solution the samples are treated with acid which would wash the basic solution off. Column 13, lines 35-40.

Claim 15: the seeding solution is applied by immersion. Column 13, lines 40-45.

Claim 17: after application of the seeding solution, the film is washed with water. Column 13, lines 40-50.

Claim 19: Heating can also occur after plating. Column 13, lines 55-60.

Claim 20: Prior to treatment the substrate can have vias formed. Column 7, lines 1-10 and column 14, lines 30-40.

Claim 23: Prior to the step of applying the basic solution, the substrate can be cleaned. Column 9, lines 5-10.

Claim 27: the polymer film can be polyimide. Column 13, lines 20-25.

Walsh teaches all the features of these claims except (1) the use of polymer stabilized catalyst particles and their features (claims 1, 6-9, 29, 31), (2) the immersion in the specific seeding solution and its time (claims 15, 16), (3) washing with deionized water (claim 17, 18).

However, Gulla teaches the known replacement of conventional palladium containing catalyst deposition for electroless plating activation with polymer stabilized palladium catalyst particles (that is, the catalyst is fixed to the suspending polymer

agent) in aqueous solution. Column 3, lines 5-20, column 3, line 55 through column 4, line 15, column 4, lines 20-40, column 15, lines 25-30. The particles can be stabilized by a water soluble polymer, such as polyvinyl pyrrolidione (PVP) or polyvinyl alcohol. Column 5, lines 45-60 and column 15, lines 25-30. The palladium (catalyst metal) particles can have diameters of 50-500 Angstroms (5-50 nm). Column 9, lines 35-50. The palladium particles can be applied as a catalyst by immersing the substrate into a solution containing the particles. Column 11, lines 25-30. The contact can be for a variable time controlled to provide desirable plating to occur in one to three minutes. Column 11, lines 25-30. Then the surface is water rinsed. Column 11, lines 35-40 and column 12, lines 35-45. The substrate to be treated can be a nonconductor such as an ABS polymer (column 10, lines 5-15) or can be an unclad circuit board (column 17, lines 25-30).

The Examiner takes Official Note that it is well known in the art of electroless plating to perform water rinsing/washing steps with deionized water. As applicant has not traversed this position from the February 4, 2008 Office Action, it is understood to be agreed to.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Walsh to use the polymer stabilized palladium catalyst particles with the features taught by Gulla as the seeding catalyst with an expectation of desirable plating results, because Walsh teaches to use, for example, appropriate conventional palladium containing solutions (column 13, lines 40-45) for seeding for

electroless plating and Gulla teaches a desirable palladium catalyst system for seeding for electroless plating is to use polymer stabilized palladium catalyst particles, stabilized with PVP or polyvinyl alcohol, for example and having a palladium particle size of 5-50 nm, and to apply the particles by immersion in a bath of the seeding solution for a period of time that can range from under one minute, and then to rinse the surface with water. As to the precise size of the particles, in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), and Gulla provides for a range of 5-50 nm. As to the precise time of contact with the seeding solution, Gulla provides for a variable contact time, indicating that it is a result effective variable, and "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). As to the use of deionized water, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water rinsing/washing steps in electroless plating processes.

19. Claims 4, 18 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walsh in view of Gulla as applied to claims 1-3, 6-10, 12, 14-17, 19-20, 23, 27, 29 and 31 above, and further in view of Fraenkel et al (US 4803097).

Walsh in view of Gulla teach all the features of these claims except (1) the hydrochloric acid solution treatment (claim 4, 30), (2) washing the applied metal layer after coating with deionized water and drying (claim 18).

Fraenkel teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 5, lines 35-60, column 1, lines 5-15 and column 13, lines 1-25. A first surface of the polymer is pretreated with a basic solution (conditioning solvent) of a material such as potassium hydroxide. Column 6, line 65 through column 7, line 25. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 13, lines 1-20. Then the substrate is immersed in an electroless plating bath. Column 12, lines 1-15 and column 13, lines 15-25. After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 8, lines 5-10. The acid solution can be a solution of hydrochloric acid. Column 8, lines 5-10. The time of contact with the basic solution can be 10 minutes. Column 12, lines 55-65. After treatment with the basic solution the samples are rinsed with water. Column 12, lines 55-65. After the electroless plating is applied, the coated article is rinsed with water. Column 13, lines 15-25. Heating can also occur after plating. Column 13, lines 45-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Walsh in view of Gulla to provide a hydrochloric acid solution treatment between the basic solution treatment and the catalyst treatment as suggested by Fraenkel in order to provide desirable conditioning of the surface, because

Walsh in view of Gulla teaches a treatment process for electroless plating with a basic solution treatment followed by a catalyst treatment with an acid treatment between, and Fraenkel teaches that when providing a basic solution treatment followed by a catalyst treatment, it is desirable to provide a hydrochloric acid solution treatment between the steps. It further would have been obvious to modify Walsh in view of Gulla to provide washing and drying after plating as suggested by Fraenkel in order to provide desirable plating, because Walsh in view of Gulla teaches to perform electroless plating, and Fraenkel teaches that it is well known to perform water rinsing (washing) after plating and heating which would provide drying. Furthermore, it would have been obvious for the water to be deionized, because as discussed in the rejection above, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water rinsing/washing steps in electroless plating processes.

20. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walsh in view of Gulla as applied to claims 1-3, 5-10, 12, 14-17, 19-20, 23, 27, 29 and 31 above, and further in view of Lake et al (US 4915983).

Walsh in view of Gulla teach all the features of this claim except spraying the layer of basic solution onto the surface of the polymer.

Lake teaches a plating method for polyimide containing circuit boards, where a treatment with potassium hydroxide solution is provided. Column 9, lines 30-65. Lake

teaches that such an application of potassium hydroxide solution can be performed by either spray or immersion. Column 9, lines 45-50.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Walsh in view of Gulla to apply the basic solution by spraying as suggested by Lake in order to provide desirable conditioning of the surface, because Walsh in view of Gulla teaches a treatment process for electroless plating with a basic solution treatment that is applied by immersion, and Lake teaches that when applying a basic solution treatment of potassium hydroxide, for example, either spray or immersion techniques can desirably be used.

21. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walsh in view of Gulla as applied to claims 1-3, 6-10, 12, 14-17, 19-20, 23, 27, 29 and 31 above, and further in view of Nuzzi et al (US 4425380).

Walsh in view of Gulla teach all the features of this claim except forming the vias by laser drilling.

Nuzzi teaches that when forming vias in substrates for circuit boards, it is well known to use laser drilling to form the holes. Column 1, lines 10-55.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Walsh in view of Gulla to form the vias by laser drilling as suggested by Nuzzi in order to provide desirable vias, because Walsh in view of Gulla teaches a treatment process for electroless plating for circuit boards with a

substrate with preformed vias, and Nuzzi teaches that a well known way to form such vias is by laser drilling.

22. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walsh in view of Gulla as applied to claims 1-3, 6-10, 12, 14-17, 19-20, 23, 27, 29 and 31 above, and further in view of Morgan (US 5543217).

Walsh in view of Gulla teach all the features of this claim except forming the cleaning by ultrasonication in acetone and deionized water.

Morgan teaches that it is well known to clean polyimide substrates using acetone in an ultrasonic bath. Column 16, lines 50-55.

The Examiner takes Official Notice that adding water to acetone and other cleaning baths is a conventional way to control the concentration. As applicant has not traversed this statement from the February 4, 2008 Office Action, it is understood to be agreed to.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Walsh in view of Gulla to clean the substrate with acetone in an ultrasonic bath as suggested by Morgan in order to provide a clean polyimide substrate, because Walsh in view of Gulla teaches a treatment process for electroless plating with a base of polyimide where precleaning can occur, and Morgan teaches that a well known way to clean polyimide is using acetone with ultrasonication. Furthermore, the use of water in the bath would be a conventional way to control the

concentration of the bath for desirable control, and as to the use of deionized water, it is the Examiner's position that this would have been obvious to one of ordinary skill in the art for desirable plating results, because it is well known to be conventional to use deionized water in water use steps in electroless plating processes as previously discussed.

23. Claims 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walsh in view of Gulla and Morgan as applied to claim 24 above, and further in view of Fraenkel et al (US 4803097).

Walsh in view of Gulla and Morgan teach all the features of these claims except the ozone cleaning.

Fraenkel teaches a method of activating and metallizing an aromatic polymer film such as a polyimide. Column 5, lines 35-60, column 1, lines 5-15 and column 13, lines 1-25. A first surface of the polymer is pretreated with a basic solution (conditioning solvent) of a material such as potassium hydroxide. Column 6, line 65 through column 7, line 25. Then a seeding solution of polymer catalyst is applied to the surface of the substrate. Column 13, lines 1-20. Then the substrate is immersed in an electroless plating bath. Column 12, lines 1-15 and column 13, lines 15-25. After the basic solution treatment, and before the catalyst treatment, an acid solution can be applied to the first surface. Column 8, lines 5-10. The acid solution can be a solution of hydrochloric acid. Column 8, lines 5-10. The time of contact with the basic solution can

be 10 minutes. Column 12, lines 55-65. After treatment with the basic solution the samples are rinsed with water. Column 12, lines 55-65. After the electroless plating is applied, the coated article is rinsed with water. Column 13, lines 15-25. Heating can also occur after plating. Column 13, lines 45-50. Fraenkel further teaches that an ozone pretreatment is provided before the basic solution step, which provides etching (which would provide further "cleaning" as surfaces would be removed). Column 4, lines 50-65. The ozone temperature treatment can be elevated. Column 4, lines 35-45. The ozone treatment can be at between 50-110 degrees C for a time of 1-5 seconds to 1-2 hours. Column 4, line 35 through column 5, line 2.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Walsh in view of Gulla and Morgan to provide the ozone pretreatment as suggested by Fraenkel in order to provide desirable conditions for the pretreatment, because Walsh in view of Gulla and Morgan teaches a pretreatment process for electroless plating, and Fraenkel teaches that in such a pretreatment process it is desirable to perform ozone treatment before the application of a basic solution. Furthermore, as to the conditions of treatment, Fraenkel teaches temperatures and times overlapping that claimed, and in the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

24. Van Der Putten et al (US 6316059) also provides the use of polymer stabilized catalyst in electroless plating. See column 5, line 65 through column 6, line 10 and column 3, lines 25-30.

Response to Arguments

25. Applicant's arguments with respect to claims 1-4, 6-10, 11-27 and 29-31 have been considered but are moot in view of the new ground(s) of rejection.

As to the suggested use of polymer stabilized catalysts on polymer surfaces before electroless plating, the Examiner has cited Gulla et al (US 4725314) as indicating that acceptable coating would be expected.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Katherine A. Bareford/
Primary Examiner, Art Unit 1792